

This Listing of Claims will replace all prior versions and listings of claims in the application:

Listing of Claims

Claim 1. (previously presented): A process for the preparation of N-(phosphonomethyl)glycine or a salt thereof, the process comprising contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with an oxidation catalyst in the presence of oxygen, wherein the catalyst:

comprises a carbon support having a noble metal at a surface of the carbon support; and

is characterized as yielding no more than about 1.2 mmole of carbon monoxide per gram of catalyst when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in the hydrogen atmosphere, is heated in a helium atmosphere from about 20 to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

Claim 2. (original): The process of claim 1 wherein the process is conducted in a continuous reactor system.

Claim 3. (original): The process of claim 1 wherein said carbon monoxide yield is no greater than about 0.7 mmole of carbon monoxide per gram of catalyst.

Claim 4. (original): The process of claim 1 wherein said carbon monoxide yield is no greater than about 0.5 mmole of carbon monoxide per gram of catalyst.

Claim 5. (original): The process of claim 1 wherein said carbon monoxide yield is no greater than about 0.3 mmole of carbon monoxide per gram of catalyst.

Claim 6. (original): The process of claim 1 wherein the oxidation is conducted in a solution or slurry, and oxygen is introduced into the solution or slurry at a rate such that at least about 40% of the oxygen is utilized.

Claim 7. (original): The process of claim 1 wherein the oxidation is conducted in a solution or slurry, and oxygen is introduced into the solution or slurry at a rate such that at least about 60% of the oxygen is utilized.

Claim 8. (original): The process of claim 1 wherein the oxidation is conducted in a solution or slurry, and oxygen is introduced into the solution or slurry at a rate such that at least about 80% of the oxygen is utilized.

Claim 9. (original): The process of claim 1 wherein the oxidation is conducted in a solution or slurry, and oxygen is introduced into the solution or slurry at a rate such that at least about 90% of the oxygen is utilized.

Claim 10. (currently amended): The process of claim 1 wherein the oxidation is conducted in a solution or slurry, and oxygen is introduced into the solution or slurry at a rate such that at least about 40% of the oxygen is utilized until at least about 80% of the ~~reagent~~ N-(phosphonomethyl)iminodiacetic acid or a salt thereof has been consumed, and then introduced into the solution or slurry at a reduced rate to enhance oxidation of formaldehyde in the solution or slurry.

Claim 11. (currently amended): The process of claim 1 wherein the oxidation is conducted in a solution or slurry and further ~~comprising~~ comprises introducing a sacrificial reducing agent into the solution or slurry.

Claim 12. (original): The process of claim 11 wherein the sacrificial reducing agent comprises formaldehyde, formic acid, or a combination thereof.

Claim 13. (previously presented): A process for the preparation of N-(phosphonomethyl)glycine or a salt thereof, the process comprising contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with an oxidation catalyst in the presence of oxygen, wherein the catalyst comprises a carbon support having a noble metal, carbon, and oxygen at a surface of the carbon support;

said catalyst being characterized as having a ratio of carbon atoms to oxygen atoms of at least about 20:1 at the surface as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 14. (original): The process of claim 13 wherein the process is conducted in a continuous reactor system.

Claim 15. (original): The process of claim 13 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 16. (original): The process of claim 13 wherein said ratio of carbon atoms to oxygen atoms is at least about 40:1.

Claim 17. (original): The process of claim 13 wherein said ratio of carbon atoms to oxygen atoms is at least about 50:1.

Claim 18. (original): The process of claim 13 wherein said ratio of carbon atoms to oxygen atoms is at least about 60:1.

Claim 19. (original): The process of claim 13 wherein the ratio of oxygen atoms to noble metal atoms at the surface is less than about 8:1 as measured by x-ray photoelectron spectroscopy.

Claim 20. (original): The process of claim 19 wherein said ratio of oxygen atoms to noble metal atoms is less than about 7:1.

Claim 21. (original): The process of claim 19 wherein said ratio of oxygen atoms to noble metal atoms is less than about 6:1.

Claim 22. (original): The process of claim 19 wherein said ratio of oxygen atoms to noble metal atoms is less than about 5:1.

Claim 23. (previously presented): A process for the preparation of N-(phosphonomethyl)glycine or a salt thereof, the process comprising contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with an oxidation catalyst in the presence of oxygen, wherein the catalyst comprises a carbon support comprising: (a) a noble metal at a surface of the carbon support; and (b) a surface layer having a thickness of about 50 Å as measured inwardly from the surface and comprising carbon and oxygen, the ratio of carbon atoms to oxygen atoms in the surface layer being at least about 20:1 as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 24. (original): The process of claim 23 wherein the process is conducted in a continuous reactor system.

Claim 25. (original): The process of claim 23 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 26. (original): The process of claim 23 wherein said ratio of carbon atoms to oxygen atoms is at least about 40:1.

Claim 27. (original): The process of claim 23 wherein said ratio of carbon atoms to oxygen atoms is at least about 50:1.

Claim 28. (original): The process of claim 23 wherein said ratio of carbon atoms to oxygen atoms is at least about 60:1.

Claim 29. (original): The process of claim 23 wherein the ratio of oxygen atoms to noble metal atoms in the surface layer is less than about 8:1 as measured by x-ray photoelectron spectroscopy.

Claim 30. (original): The process of claim 29 wherein said ratio of oxygen atoms to noble metal atoms is less than about 7:1.

Claim 31. (original): The process of claim 29 wherein said ratio of oxygen atoms to noble metal atoms is less than about 6:1.

Claim 32. (original): The process of claim 29 wherein said ratio of oxygen atoms to noble metal atoms is less than about 5:1.

Claim 33. (currently amended): A process for the preparation of N-(phosphonomethyl)glycine or a salt thereof, the process comprising:

forming an oxidation catalyst by a process comprising depositing a noble metal and a promoter at a surface of a carbon support, and then heating the surface at a temperature of at least about 400°C; and

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with the oxidation catalyst in the presence of oxygen.

Claim 34. (original): The process of claim 33 wherein the N-(phosphonomethyl)iminodiacetic acid or a salt thereof is

contacted with the oxidation catalyst in the presence of oxygen in a continuous reactor system.

Claim 35. (original): The process of claim 33 wherein said temperature is at least about 500°C.

Claim 36. (original): The process of claim 33 wherein said temperature is from about 550 to about 1,200°C.

Claim 37. (original): The process of claim 33 wherein said temperature is from about 550 to about 900°C.

Claim 38. (original): The process of claim 33 wherein, before the noble metal deposition, the carbon support has carbon and oxygen at the surface of the carbon support in amounts such that the ratio of carbon atoms to oxygen atoms at the surface is at least about 20:1 as measured by x-ray photoelectron spectroscopy.

Claim 39. (original): The process of claim 33 wherein said heating is conducted in a non-oxidizing environment.

Claim 40. (original): The process of claim 39 wherein said temperature is at least about 500°C.

Claim 41. (original): The process of claim 39 wherein said temperature is from about 550 to about 1,200°C.

Claim 42. (original): The process of claim 39 wherein the non-oxidizing environment consists essentially of at least one gas selected from the group consisting of N<sub>2</sub> and the noble gases.

Claim 43. (original): The process of claim 39 wherein, before the noble metal deposition, the carbon support has carbon and oxygen at the surface of the carbon support in amounts such that the ratio of carbon atoms to oxygen atoms at the surface

before the noble metal deposition is at least about 20:1 as measured by x-ray photoelectron spectroscopy.

Claim 44. (original): The process of claim 39 wherein the non-oxidizing environment comprises a reducing environment.

Claim 45. (original): The process of claim 44 wherein said temperature is at least about 500°C.

Claim 46. (original): The process of claim 44 wherein said temperature is from about 550 to about 1,200°C.

Claim 47. (original): The process of claim 44 wherein the reducing environment comprises H<sub>2</sub>.

Claim 48. (original): The process of claim 44 wherein, before the noble metal deposition, the carbon support has carbon and oxygen at the surface of the carbon support in amounts such that the ratio of carbon atoms to oxygen atoms at the surface before the noble metal deposition is at least about 20:1 as measured by x-ray photoelectron spectroscopy.

Claim 49. (original): A process for the preparation of N-(phosphonomethyl)glycine or a salt thereof, the process comprising:

forming an oxidation catalyst by a process comprising: (a) depositing a noble metal at a surface of a carbon support, and (b) exposing the surface to a reducing environment; and

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with the oxidation catalyst in the presence of oxygen,

wherein, before the noble metal deposition, the carbon support has carbon and oxygen at the surface of the carbon support in amounts such that the ratio of carbon atoms to oxygen atoms at the surface is at least 20:1 as measured by x-ray photoelectron spectroscopy.

Claim 50. (original): The process of claim 49 wherein the N-(phosphonomethyl)iminodiacetic acid or a salt thereof is contacted with the oxidation catalyst in the presence of oxygen in a continuous reactor system.

Claim 51. (original): The process of claim 49 wherein the reducing environment comprises ammonia.

Claim 52. (original): The process of claim 49 wherein the reducing environment comprises  $\text{NaBH}_4$ .

Claim 53. (original): A process for the preparation of N-(phosphonomethyl)glycine or a salt thereof, the process comprising contacting, in the presence of oxygen, N-(phosphonomethyl)iminodiacetic acid or a salt thereof with a catalyst comprising a carbon support having a noble metal, a promoter, carbon, and oxygen at a surface of the carbon support.

Claim 54. (previously presented): The process of claim 53 wherein the process is conducted in a continuous reactor system.

Claim 55. (original): The process of claim 53 wherein at least 0.05% by weight of the catalyst consists of at least one promoter.

Claim 56. (original): The process of claim 53 wherein the promoter is more easily oxidized than the noble metal.

Claim 57. (original): The process of claim 53 wherein the promoter comprises a metal selected from the group consisting of tin, bismuth, lead, cadmium, magnesium, manganese, nickel, aluminum, cobalt, titanium, antimony, selenium, iron, rhenium, cerium, zinc, and zirconium.

Claim 58. (original): The process of claim 53 wherein the promoter comprises tin.



Claim 59. (original): The process of claim 53 wherein the promoter comprises iron.

Claim 60. (original): The process of claim 53 wherein the promoter comprises titanium.

Claim 61. (original): The process of claim 53 wherein at least two promoters are at the surface of the carbon support.

Claim 62. (original): The process of claim 61 wherein the promoters comprise iron and tin.

Claim 63. (original): The process of claim 53 wherein noble metal atoms at the surface are alloyed with the promoter.

Claim 64. (original): The process of claim 53 wherein a majority of the noble metal atoms at the surface are alloyed with the promoter.

Claim 65. (original): The process of claim 53 wherein substantially all of the noble metal atoms at the surface are alloyed with the promoter.

Claim 66. (original): The process of claim 53 wherein the catalyst is characterized as having a ratio of carbon atoms to oxygen atoms at the surface which is at least about 20:1 as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 67. (original): The process of claim 66 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 68. (original): The process of claim 66 wherein said ratio of carbon atoms to oxygen atoms is at least about 40:1.

Claim 69. (original): The process of claim 66 wherein said ratio of carbon atoms to oxygen atoms is at least about 50:1.

Claim 70. (original): The process of claim 66 wherein said ratio of carbon atoms to oxygen atoms is at least about 60:1.

Claim 71. (original): The process of claim 66 wherein the catalyst is further characterized as having a ratio of oxygen atoms to noble metal atoms at the surface which is less than about 8:1 after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 72. (original): The process of claim 71 wherein said ratio of oxygen atoms to noble metal atoms is less than about 7:1.

Claim 73. (original): The process of claim 71 wherein said ratio of oxygen atoms to noble metal atoms is less than about 6:1.

Claim 74. (original): The process of claim 71 wherein said ratio of oxygen atoms to noble metal atoms is less than about 5:1.

Claim 75. (original): The process of claim 53 wherein the catalyst is characterized as yielding no more than about 1.2 mmole of carbon monoxide per gram of catalyst when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in the hydrogen atmosphere, is heated in a helium atmosphere from about 20 to

about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

Claim 76. (original): The process of claim 75 wherein said carbon monoxide yield is no greater than about 0.7 mmole of carbon monoxide per gram of catalyst.

Claim 77. (original): The process of claim 75 wherein said carbon monoxide yield is no greater than about 0.5 mmole of carbon monoxide per gram of catalyst.

Claim 78. (original): The process of claim 75 wherein said carbon monoxide yield is no greater than about 0.3 mmole of carbon monoxide per gram of catalyst.

Claim 79. (original): A process for the preparation of N-(phosphonomethyl)glycine or a salt thereof, the process comprising contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with an oxidation catalyst in the presence of oxygen, wherein the catalyst comprises a carbon support having: (a) a noble metal and a promoter at a surface of the carbon support; and (b) a surface layer having a thickness of about 50 Å as measured inwardly from the surface and comprising carbon and oxygen, the catalyst being characterized as having a ratio of carbon atoms to oxygen atoms in the surface layer which is at least about 20:1 as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 80. (original): The process of claim 79 wherein the process is contacted in a continuous reactor system.

Claim 81. (original): The process of claim 79 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 82. (original): The process of claim 79 wherein said ratio of carbon atoms to oxygen atoms is at least about 40:1.

Claim 83. (original): The process of claim 79 wherein said ratio of carbon atoms to oxygen atoms is at least about 50:1.

Claim 84. (original): The process of claim 79 wherein said ratio of carbon atoms to oxygen atoms is at least about 60:1.

Claim 85. (original): The process of claim 79 wherein the catalyst is further characterized as having a ratio of oxygen atoms to noble metal atoms in the surface layer which is less than about 8:1 after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 86. (original): The process of claim 85 wherein said ratio of oxygen atoms to noble metal atoms is less than about 7:1.

Claim 87. (original): The process of claim 85 wherein said ratio of oxygen atoms to noble metal atoms is less than about 6:1.

Claim 88. (original): The process of claim 85 wherein said ratio of oxygen atoms to noble metal atoms is less than about 5:1.

Claim 89. (original): The process of claim 79 wherein at least 0.05% by weight of the catalyst consists of at least one promoter.

Claim 90. (original): The process of claim 79 wherein the promoter is more easily oxidized than the noble metal.

Claim 91. (original): The process of claim 79 wherein the promoter comprises a metal selected from the group consisting of tin, bismuth, lead, cadmium, magnesium, manganese, nickel, aluminum, cobalt, titanium, antimony, selenium, iron, rhenium, cerium, zinc, and zirconium.

Claim 92. (original): The process of claim 79 wherein the promoter comprises tin.

Claim 93. (original): The process of claim 79 wherein the promoter comprises iron.

Claim 94. (original): The process of claim 79 wherein the promoter comprises titanium.

Claim 95. (original): The process of claim 79 wherein at least two promoters are at the surface of the carbon support.

Claim 96. (original): The process of claim 95 wherein the promoters comprise iron and tin.

Claim 97. (original): The process of claim 79 wherein noble metal atoms at the surface are alloyed with the promoter.

Claim 98. (original): The process of claim 79 wherein a majority of the noble metals at the surface are alloyed with the promoter.

Claim 99. (original): The process of claim 79 wherein substantially all of the noble metal atoms at the surface are alloyed with the promoter.

Claim 100. (previously presented): A process for the preparation of a product comprising N-(phosphonomethyl)glycine or a salt thereof by oxidizing a reagent comprising N-

(phosphonomethyl)iminodiacetic acid or a salt thereof, the process comprising:

continuously contacting an aqueous feed stream comprising said reagent with an oxygen source in a stirred tank reactor of a continuous reactor system and in the presence of a particulate catalyst comprising a particulate carbon support having a noble metal at a surface of the carbon support, thereby producing a product mixture comprising said product;

separating the particulate catalyst from the product mixture by filtration, thereby producing a product filtrate comprising said product; and

isolating said product from the product filtrate.

Claim 101. (previously presented): A process as set forth in claim 100 wherein said reagent is contacted with said oxygen source in the presence of a catalyst effective for oxidizing formaldehyde to carbon dioxide and water.

Claim 102. (previously presented): A process as set forth in claim 101 wherein said particulate catalyst is effective both for the oxidation of said reagent and for the oxidation of formaldehyde.

Claim 103. (previously presented): A process as set forth in claim 102 wherein said product mixture contains no greater than about 2.4% by weight formaldehyde.

Claim 104. (previously presented): A process as set forth in claim 103 wherein said product mixture contains no greater than about 1.4% by weight formaldehyde.

Claim 105. (previously presented): A process as set forth in claim 104 wherein said product mixture contains at least about 5% by weight of said product and less than about 0.5% by weight of formaldehyde.

Claim 106. (previously presented): A process as set forth in claim 105 wherein said catalyst is resistant to dissolution of noble metal in the product mixture so that, at a conversion of said reagent to said product of 95%, the extent of dissolution of noble metal in the aqueous reaction mixture is no greater than about 5.3 µg/g N-(phosphonomethyl)glycine produced in the reaction.

Claim 107. (previously presented): A process as set forth in claim 106 wherein the resistance of the catalyst to dissolution of noble metal is such that the extent of dissolution of noble metal in said product mixture is less than about 1.0 µg/g of said product produced in the reaction.

Claim 108. (previously presented): A process as set forth in claim 106 wherein the concentration of said product in said product mixture is from about 5% to about 40% by weight.

Claim 109. (previously presented): A process as set forth in claim 108 wherein the concentration of said product in said product mixture is from about 8% to about 30% by weight.

Claim 110. (previously presented): A process as set forth in claim 109 wherein said product mixture contains at least about 9% by weight of said product and less than about 0.5% by weight of formaldehyde.

Claim 111. (previously presented): A process as set forth in claim 110 wherein the concentration of said product in said product mixture is from about 9% to about 15% by weight.

Claim 112. (previously presented): A process as set forth in claim 111 wherein said noble metal comprises platinum, and the platinum content of said product mixture is less than about 1.0 µg/g of product produced in the reaction.

Claim 113. (previously presented): A process as set forth in claim 109 wherein said oxygen source comprises molecular oxygen.

Claim 114. (previously presented): A process as set forth in claim 113 wherein the formaldehyde content of said product mixture is less than about 0.3% by weight.

Claim 115. (previously presented): A process as set forth in claim 114 wherein the reagent content of the product mixture is no greater than about 0.44% by weight.

Claim 116. (previously presented): A process as set forth in claim 113 wherein the reagent content of the product mixture is at least about 0.08% by weight.

Claim 117. (previously presented): A process as set forth in claim 116 comprising:

continuously contacting a first aqueous reaction medium comprising said feed stream with molecular oxygen in said stirred tank reactor to oxidize the bulk of the reagent and produce said product, formaldehyde and formic acid; and

continuously contacting another aqueous reaction medium containing said product, formaldehyde and formic acid produced in said first aqueous reaction medium with molecular oxygen fed to the continuous reactor system at a reduced rate as compared to the molecular oxygen with which said first aqueous reaction medium is contacted in said stirred tank reactor to oxidize formaldehyde and produce said product mixture.

Claim 118. (previously presented): A process as set forth in claim 117 wherein said oxygen source is molecular oxygen that is introduced separately into said first aqueous reaction medium and into said another aqueous reaction medium.



Claim 119. (previously presented): A process as set forth in claim 118 wherein said another aqueous reaction medium comprises unreacted reagent from said feed stream remaining in said first aqueous reaction medium, the process further comprising oxidizing reagent in said another aqueous reaction medium to produce additional product.

Claim 120. (previously presented): A process as set forth in claim 119 wherein said another aqueous reaction medium is continuously contacted with molecular oxygen in another stirred tank reactor of the continuous reactor system.

Claim 121. (previously presented): A process as set forth in claim 120 wherein 75% of said reagent in said feed stream is consumed in said stirred tank reactor of the continuous reactor system.

Claim 122. (previously presented): A process as set forth in claim 121 wherein 80% of said reagent in said feed stream is consumed in said stirred tank reactor of the continuous reactor system.

Claim 123. (previously presented): A process as set forth in claim 122 wherein the oxygen feed rate to said stirred tank reactor is greater than about 0.4 L/(kg reaction medium) (min.) and the oxygen feed rate to said another stirred tank reactor is greater than about 0.19 L/(kg reaction medium) (min.).

Claim 124. (previously presented): A process as set forth in claim 122 wherein the oxygen feed rate to the continuous reactor system is such that 40% of the oxygen is utilized.

Claim 125. (previously presented): A process as set forth in claim 124 wherein the oxygen feed rate to the continuous reactor system is such that 60% of the oxygen is utilized.

Claim 126. (previously presented): A process as set forth in claim 125 wherein the oxygen feed rate to the continuous reactor system is such that 80% of the oxygen is utilized.

Claim 127. (previously presented): A process as set forth in claim 126 wherein the oxygen feed rate to the continuous reactor system is such that 90% of the oxygen is utilized.

Claim 128. (previously presented): A process as set forth in claim 125 wherein the pH of the aqueous reaction medium in each of the stirred tank reactors is less than 3.

Claim 129. (previously presented): A process as set forth in claim 128 wherein the pH of the aqueous reaction medium in each of the stirred tank reactors is from about 1 to about 2.

Claim 130. (previously presented): A process as set forth in claim 129 wherein the residence time in the continuous reactor system is from about 3 to about 120 minutes.

Claim 131. (previously presented): A process as set forth in claim 130 wherein the residence time in the continuous reactor system is from about 5 to about 90 minutes.

Claim 132. (previously presented): A process as set forth in claim 131 wherein the residence time in the continuous reactor system is from about 5 to about 60 minutes.

Claim 133. (previously presented): A process as set forth in claim 132 wherein the residence time in said another stirred tank reactor is from about 2 to about 40 minutes.

Claim 134. (previously presented): A process as set forth in claim 133 wherein the residence time in said another stirred tank reactor is from about 5 to about 20 minutes.

Claim 135. (previously presented): A process as set forth in claim 134 wherein the residence time in said another stirred tank reactor is from about 5 to about 15 minutes.

Claim 136. (previously presented): A process as set forth in claim 135 wherein the temperature in said another stirred tank reactor is maintained equal to or less than the temperature in said stirred tank reactor, and the pressure in said another stirred tank reactor is maintained equal to or less than the pressure in said stirred tank reactor.

Claim 137. (previously presented): A process as set forth in claim 135 wherein the reduced oxygen feed rate in said another stirred tank reactor is effective to produce a lesser proportion of by-product aminomethylphosphonic acid than would be produced under otherwise identical conditions except for the reduced oxygen feed rate into said another stirred tank reactor.

Claim 138. (previously presented): A process as set forth in claim 137 wherein the concentration of formaldehyde in said product mixture is less than about 0.15% by weight.

Claim 139. (previously presented): A process as set forth in claim 137 wherein the catalyst is recycled to the continuous reactor system and reused in oxidation of reagent and formaldehyde.

Claim 140. (previously presented): A process as set forth in claim 139 wherein product is isolated from the product filtrate obtained from filtration of the product mixture for separation of the catalyst.

Claim 141. (previously presented): A process as set forth in claim 140 wherein a sacrificial reducing agent is introduced into the continuous reactor system.

Claim 142. (previously presented): A process as set forth in claim 141 wherein formaldehyde produced in the continuous reactor system is recycled to the continuous reactor system.

Claim 143. (previously presented): A process as set forth in claim 142 wherein unreacted formic acid and formaldehyde are removed from the product mixture and recycled to the continuous reactor system as a source of said sacrificial reducing agent.

Claim 144. (previously presented): A process as set forth in claim 143 wherein said catalyst further comprises a promoter at the surface of the carbon support, said promoter constituting at least 0.05% by weight of the catalyst.

Claim 145. (previously presented): A process as set forth in claim 144 wherein said promoter is a metal selected from tin, bismuth, lead, cadmium, magnesium, manganese, nickel, aluminum, cobalt, titanium, antimony, selenium, iron, rhenium, cerium, zinc, and zirconium.

Claim 146. (previously presented): A process as set forth in claim 145 wherein said promoter is a metal selected from iron, bismuth, tin and titanium.

Claim 147. (previously presented): A process as set forth in claim 146 wherein the total promoter content constitutes no greater than about 10% by weight of the catalyst.

Claim 148. (previously presented): A process as set forth in claim 147 wherein the total promoter content constitutes from about 0.1% to about 2% by weight of the catalyst.

Claim 149. (previously presented): A process as set forth in claim 148 wherein the total promoter content constitutes from about 0.2% to about 1.5% by weight of the catalyst.

Claim 150. (previously presented): A process as set forth in claim 147 wherein, before said oxidation of said reagent, the catalyst is characterized such that no more than about 1.2 mmole of carbon monoxide per gram of catalyst is desorbed when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in a hydrogen atmosphere is heated in a helium atmosphere from about 20 to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

Claim 151. (previously presented): A process as set forth in claim 150 wherein, before said oxidation of said reagent, the catalyst is characterized such that no more than about 0.7 mmole of carbon monoxide per gram of catalyst is desorbed when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in a hydrogen atmosphere is heated in a helium atmosphere from about 20 to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

Claim 152. (previously presented): A process as set forth in claim 151 wherein, before said oxidation of said reagent, the catalyst is characterized such that no more than about 0.5 mmole of carbon monoxide per gram of catalyst is desorbed when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in a hydrogen atmosphere is heated in a helium atmosphere from about 20 to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

Claim 153. (currently amended): A process as set forth in claim 152 wherein, before said oxidation of said reagent, the catalyst is characterized such that no more than about 0.3

mmole[s] of carbon monoxide per gram of catalyst is desorbed when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in a hydrogen atmosphere is heated in a helium atmosphere from about 20 to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

154. (previously presented): A process as set forth in claim 151 wherein the carbon support has a specific surface area of from about 10 to about 3,000 m<sup>2</sup>/g, as measured by the Brunauer-Emmett-Teller method.

Claim 155. (previously presented): A process as set forth in claim 154 wherein:

the catalyst further comprises carbon and oxygen at the surface of the carbon support and before said oxidation of said reagent, the catalyst is characterized as having a ratio of carbon atoms to oxygen atoms of at least about 20:1 at the surface of the carbon support as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 156. (previously presented): A process as set forth in claim 155 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 157. (previously presented): A process as set forth in claim 156 wherein said ratio of carbon atoms to oxygen atoms is at least about 40:1.

Claim 158. (previously presented): A process as set forth in claim 157 wherein said ratio of carbon atoms to oxygen atoms is at least about 50:1.

Claim 159. (previously presented): A process as set forth in claim 158 wherein said ratio of carbon atoms to oxygen atoms is at least about 60:1.

Claim 160. (previously presented): A process as set forth in claim 156 wherein the promoter is more easily oxidized than the noble metal.

Claim 161. (previously presented): A process as set forth in claim 160 wherein said catalyst is prepared by a process comprising depositing a noble metal at the surface of the carbon support, and then heating the surface of the carbon support at a temperature greater than about 500°C.

Claim 162. (previously presented): A process as set forth in claim 161 wherein the surface of the carbon support is heated at a temperature from about 550 to about 1,200°C.

Claim 163. (previously presented): A process as set forth in claim 162 wherein the surface of the carbon support is heated at temperature from about 550 to about 900°C.

Claim 164. (previously presented): A process as set forth in claim 163 wherein said heating of the surface of the carbon support is conducted in the presence of a gas selected from N<sub>2</sub>, a noble gas, H<sub>2</sub>, ammonia, and carbon monoxide.

Claim 165. (previously presented): A process as set forth in claim 162 wherein, before the noble metal deposition, the carbon support has carbon and oxygen at the surface of the carbon support in amounts such that the ratio of carbon atoms to oxygen atoms at the surface is at least about 20:1 as measured by x-ray photoelectron spectroscopy.

Claim 166. (previously presented): A process as set forth in claim 165 wherein noble metal atoms at the surface of the carbon support are alloyed with the promoter.

Claim 167. (previously presented): A process as set forth in claim 166 wherein a majority of the noble metal atoms at the surface of the carbon support are alloyed with the promoter.

Claim 168. (previously presented): A process as set forth in claim 167 wherein substantially all the noble metal atoms at the surface of the carbon support are alloyed with the promoter.

Claim 169. (previously presented): A process as set forth in claim 166 wherein the promoter comprises tin.

Claim 170. (previously presented): A process as set forth in claim 166 wherein the promoter comprises iron.

Claim 171. (previously presented): A process as set forth in claim 166 wherein the promoter comprises titanium.

Claim 172. (previously presented): A process as set forth in claim 166 wherein the promoter comprises bismuth.

Claim 173. (previously presented): A process as set forth in claim 166 wherein the catalyst comprises two promoters at the surface of the carbon support, each said promoter constituting at least 0.05% by weight of the catalyst.

Claim 174. (previously presented): A process as set forth in claim 173 wherein the promoters comprise iron and tin.

Claim 175. (previously presented): A process as set forth in claim 166 wherein at least about 95% of the particles of the particulate carbon support are from about 2 to about 300  $\mu\text{m}$  in their largest dimension.



Claim 176. (previously presented): A process as set forth in claim 175 wherein at least about 98% of the particles of the particulate carbon support are from about 2 to about 200  $\mu\text{m}$  in their largest dimension.

Claim 177. (previously presented): A process as set forth in claim 175 wherein the carbon support has a specific surface area of from about 500 to about 2,100  $\text{m}^2/\text{g}$ , as measured by the Brunauer-Emmett-Teller method.

Claim 178. (previously presented): A process as set forth in claim 177 wherein the carbon support has a specific surface area of from about 750 to about 2,100  $\text{m}^2/\text{g}$ , as measured by the Brunauer-Emmett-Teller method.

Claim 179. (previously presented): A process as set forth in claim 178 wherein the carbon support has a specific surface area of from about 750 to about 1,750  $\text{m}^2/\text{g}$ , as measured by the Brunauer-Emmett-Teller method.

Claim 180. (previously presented): A process as set forth in claim 177 wherein the pore volume of the carbon support is from about 0.1 to about 2.5  $\text{ml/g}$ .

Claim 181. (previously presented): A process as set forth in claim 180 wherein the pore volume of the carbon support is from about 0.2 to about 2.0  $\text{ml/g}$ .

Claim 182. (previously presented): A process as set forth in claim 181 wherein the pore volume of the carbon support is from about 0.4 to about 1.7  $\text{ml/g}$ .

Claim 183. (previously presented): A process as set forth in claim 177 wherein the concentration of noble metal deposited at the surface of the carbon support is from about 0.5% to about 20% by weight of the catalyst.

Claim 184. (previously presented): A process as set forth in claim 183 wherein the concentration of noble metal deposited at the surface of the carbon support is from about 2.5% to about 10% by weight of the catalyst.

Claim 185. (previously presented): A process as set forth in claim 184 wherein the concentration of noble metal deposited at the surface of the carbon support is from about 3% to about 7.5% by weight of the catalyst.

Claim 186. (previously presented): A process as set forth in claim 184 wherein the dispersion of noble metal deposited at the surface of the carbon support is such that the concentration of surface noble metal atoms is from about 10 to about 400  $\mu\text{moles/g}$  as measured by chemisorption of hydrogen using a Micromeritics ASAP 2010C or Altamira AMI100 instrument.

Claim 187. (previously presented): A process as set forth in claim 186 wherein the dispersion of noble metal is such that the concentration of surface noble metal atoms is from about 10 to about 150  $\mu\text{moles/g}$ .

Claim 188. (previously presented): A process as set forth in claim 187 wherein the dispersion of noble metal is such that the concentration of surface noble metal atoms is from about 15 to about 100  $\mu\text{moles}$ .

Claim 189. (previously presented): A process as set forth in claim 187 wherein the noble metal is at the surface of the carbon support in the form of metal particles and at least about 90% (number density) of the noble metal particles at the surface of the carbon support are from about 0.5 to about 35 nm in their largest dimension.

Claim 190. (previously presented): A process as set forth in claim 189 wherein at least about 90% (number density) of the

noble metal particles at the surface of the carbon support are from about 1 to about 20 nm in their largest dimension.

Claim 191. (previously presented): A process as set forth in claim 190 wherein at least about 90% (number density) of the noble metal particles at the surface of the carbon support are from about 1.5 to about 10 nm in their largest dimension.

Claim 192. (previously presented): A process as set forth in claim 190 wherein at least about 80% (number density) of the noble metal particles at the surface of the carbon support are from about 1.5 to about 7 nm in their largest dimension.

Claim 193. (previously presented): A process as set forth in claim 192 wherein said catalyst contains from about 0.1% to about 2% iron.

Claim 194. (previously presented): A process as set forth in claim 193 wherein, before said oxidation of said reagent, the catalyst is further characterized as having a ratio of oxygen atoms to noble metal atoms at the surface of the carbon support which is less than about 7:1 as measured by x-ray photoelectron spectroscopy.

Claim 195. (previously presented): A process as set forth in claim 194 wherein said ratio of oxygen atoms to noble metal atoms at the surface of the carbon support is less than about 6:1.

Claim 196. (previously presented): A process as set forth in claim 195 wherein said ratio of oxygen atoms to noble metal atoms at the surface of the carbon support is less than about 5:1.

Claim 197. (previously presented): A process as set forth in claim 193 wherein said product is isolated from said product filtrate by precipitation.

Claim 198. (previously presented): A process as set forth in claim 197 wherein said product is isolated by evaporation of a portion of the water contained in said product filtrate to produce a more concentrated solution of said product, and the more concentrated solution is cooled for crystallization of said product.

Claim 199. (previously presented): A process as set forth in claim 198 wherein the catalyst is also effective for oxidation of formic acid to carbon dioxide and water, and formic acid produced in the continuous reactor system is also oxidized in the continuous reactor system.

Claim 200. (previously presented): A process as set forth in claim 1 comprising:

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said catalyst and oxygen, thereby producing a used catalyst and a liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst and oxygen, thereby producing additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 201. (previously presented): A process as set forth in claim 200 further comprising:

separating said additional liquid reaction product from said used catalyst.

Claim 202. (previously presented): A process as set forth in claim 201 further comprising repetitively contacting said used catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional liquid reaction product.

Claim 203. (previously presented): A process as set forth in claim 202 comprising:

initially contacting said catalyst with oxygen and N-(phosphonomethyl)iminodiacetic acid or a salt thereof in a first reaction cycle, to produce a used catalyst and a first liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said first liquid reaction from said used catalyst;

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst in another reaction cycle to produce additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said additional liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof in each of a series of further reaction cycles to produce further additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof in each of said further series of cycles.

Claim 204. (previously presented): A process as set forth in claim 203 wherein said used catalyst is separated from further additional liquid reaction product in each of said cycles.

Claim 205. (previously presented): A process as set forth in claim 200 wherein said catalyst comprises a particulate noble metal on carbon catalyst that is slurried in a liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid, said

used catalyst being separated from said liquid reaction product by filtration.

Claim 206. (previously presented): A process as set forth in claim 13 comprising:

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said catalyst and oxygen, thereby producing a used catalyst and a liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst and oxygen, thereby producing additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 207. (previously presented): A process as set forth in claim 206 further comprising:

separating said additional liquid reaction product from said used catalyst.

Claim 208. (previously presented): A process as set forth in claim 207 further comprising repetitively contacting said used catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional liquid reaction product.

Claim 209. (previously presented): A process as set forth in claim 208 comprising:

initially contacting said catalyst with oxygen and N-(phosphonomethyl)iminodiacetic acid or a salt thereof in a first reaction cycle, to produce a used catalyst and a first liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said first liquid reaction from said used catalyst;

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst in another reaction cycle to produce additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said additional liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof in each of a series of further reaction cycles to produce further additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof in each of said further series of cycles.

Claim 210. (previously presented): A process as set forth in claim 209 wherein said used catalyst is separated from further additional liquid reaction product in each of said cycles.

Claim 211. (previously presented): A process as set forth in claim 206 wherein said catalyst comprises a particulate noble metal on carbon catalyst that is slurried in a liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid, said used catalyst being separated from said liquid reaction product by filtration.

Claim 212. (previously presented): A process as set forth in claim 23 comprising:

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said catalyst and oxygen, thereby producing a used catalyst and a liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst and oxygen, thereby producing additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 213. (previously presented): A process as set forth in claim 212 further comprising:

separating said additional liquid reaction product from said used catalyst.

Claim 214. (previously presented): A process as set forth in claim 213 further comprising repetitively contacting said used catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional liquid reaction product.

Claim 215. (previously presented): A process as set forth in claim 214 comprising:

initially contacting said catalyst with oxygen and N-(phosphonomethyl)iminodiacetic acid or a salt thereof in a first reaction cycle, to produce a used catalyst and a first liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said first liquid reaction from said used catalyst;

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst in another reaction cycle to produce additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said additional liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof in each of a series of further reaction cycles to produce further additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof in each of said further series of cycles.

Claim 216. (previously presented): A process as set forth in claim 215 wherein said used catalyst is separated from further additional liquid reaction product in each of said cycles.



Claim 217. (previously presented): A process as set forth in claim 212 wherein said catalyst comprises a particulate noble metal on carbon catalyst that is slurried in a liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid, said used catalyst being separated from said liquid reaction product by filtration.

Claim 218. (previously presented): A process as set forth in claim 33 comprising:

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said catalyst and oxygen, thereby producing a used catalyst and a liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst and oxygen, thereby producing additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 219. (previously presented): A process as set forth in claim 218 further comprising:

separating said additional liquid reaction product from said used catalyst.

Claim 220. (previously presented): A process as set forth in claim 219 further comprising repetitively contacting said used catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional liquid reaction product.

Claim 221. (previously presented): A process as set forth in claim 220 comprising:

initially contacting said catalyst with oxygen and N-(phosphonomethyl)iminodiacetic acid or a salt thereof in a first reaction cycle, to produce a used catalyst and a first liquid

reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said first liquid reaction from said used catalyst;

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst in another reaction cycle to produce additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said additional liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof in each of a series of further reaction cycles to produce further additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof in each of said further series of cycles.

Claim 222. (previously presented): A process as set forth in claim 221 wherein said used catalyst is separated from further additional liquid reaction product in each of said cycles.

Claim 223. (previously presented): A process as set forth in claim 218 wherein said catalyst comprises a particulate noble metal on carbon catalyst that is slurried in a liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid, said used catalyst being separated from said liquid reaction product by filtration.

Claim 224. (previously presented): A process as set forth in claim 49 comprising:

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said catalyst and oxygen, thereby producing a used catalyst and a liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst and oxygen, thereby producing additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 225. (previously presented): A process as set forth in claim 224 further comprising:

separating said additional liquid reaction product from said used catalyst.

Claim 226. (previously presented): A process as set forth in claim 225 further comprising repetitively contacting said used catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional liquid reaction product.

Claim 227. (previously presented): A process as set forth in claim 226 comprising:

initially contacting said catalyst with oxygen and N-(phosphonomethyl)iminodiacetic acid or a salt thereof in a first reaction cycle, to produce a used catalyst and a first liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said first liquid reaction from said used catalyst;

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst in another reaction cycle to produce additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said additional liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof in each of a series of further reaction cycles to produce further additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof in each of said further series of cycles.

Claim 228. (previously presented): A process as set forth in claim 227 wherein said used catalyst is separated from further additional liquid reaction product in each of said cycles.

Claim 229. (previously presented): A process as set forth in claim 224 wherein said catalyst comprises a particulate noble metal on carbon catalyst that is slurried in a liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid, said used catalyst being separated from said liquid reaction product by filtration.

Claim 230. (previously presented): A process as set forth in claim 53 comprising:

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said catalyst and oxygen, thereby producing a used catalyst and a liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst and oxygen, thereby producing additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 231. (previously presented): A process as set forth in claim 230 further comprising:

separating said additional liquid reaction product from said used catalyst.

Claim 232. (previously presented): A process as set forth in claim 231 further comprising repetitively contacting said used catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional liquid reaction product.

Claim 233. (previously presented): A process as set forth in claim 232 comprising:

initially contacting said catalyst with oxygen and N-(phosphonomethyl)iminodiacetic acid or a salt thereof in a first reaction cycle, to produce a used catalyst and a first liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said first liquid reaction from said used catalyst;

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst in another reaction cycle to produce additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said additional liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof in each of a series of further reaction cycles to produce further additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof in each of said further series of cycles.

Claim 234. (previously presented): A process as set forth in claim 233 wherein said used catalyst is separated from further additional liquid reaction product in each of said cycles.

Claim 235. (previously presented): A process as set forth in claim 230 wherein said catalyst comprises a particulate noble metal on carbon catalyst that is slurried in a liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid, said used catalyst being separated from said liquid reaction product by filtration.

Claim 236. (previously presented): A process as set forth in claim 79 comprising:

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said catalyst and oxygen, thereby producing a used

catalyst and a liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst and oxygen, thereby producing additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 237. (previously presented): A process as set forth in claim 236 further comprising:

separating said additional liquid reaction product from said used catalyst.

Claim 238. (previously presented): A process as set forth in claim 237 further comprising repetitively contacting said used catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional liquid reaction product.

Claim 239. (previously presented): A process as set forth in claim 238 comprising:

initially contacting said catalyst with oxygen and N-(phosphonomethyl)iminodiacetic acid or a salt thereof in a first reaction cycle, to produce a used catalyst and a first liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said first liquid reaction from said used catalyst;

contacting N-(phosphonomethyl)iminodiacetic acid or a salt thereof with said used catalyst in another reaction cycle to produce additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof;

separating said additional liquid reaction product from said used catalyst; and

contacting additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof in each of a series of further reaction cycles to produce further additional liquid reaction product comprising N-(phosphonomethyl)glycine or a salt thereof in each of said further series of cycles.

Claim 240. (previously presented): A process as set forth in claim 239 wherein said used catalyst is separated from further additional liquid reaction product in each of said cycles.

Claim 241. (previously presented): A process as set forth in claim 236 wherein said catalyst comprises a particulate noble metal on carbon catalyst that is slurried in a liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid, said used catalyst being separated from said liquid reaction product by filtration.

Claim 242. (previously presented): A process as set forth in claim 100 wherein the used particulate catalyst separated from the product mixture is recycled to the continuous reactor system and additional N-(phosphonomethyl)iminodiacetic acid or a salt thereof is contacted with said used catalyst and oxygen, thereby producing additional product mixture comprising N-(phosphonomethyl)glycine or a salt thereof.

Claim 243. (previously presented): A process as set forth in claim 242 further comprising:

separating said used particulate catalyst from said additional product mixture by filtration.

Claim 244. (previously presented): A process as set forth in claim 243 further comprising repetitively contacting said used particulate catalyst with oxygen and further additional N-(phosphonomethyl)glycine or a salt thereof to produce further additional product mixture.

Claims 245 and 246 (canceled).

Claim 247. (previously presented): A process as set forth in claim 242 wherein said particulate catalyst is slurried in a liquid reaction medium within said stirred tank reactor, said liquid reaction medium comprising N-(phosphonomethyl)iminodiacetic acid or a salt thereof.

Claim 248. (previously presented): A process for oxidizing a reagent in a mixture, the mixture being able to solubilize a noble metal, the process comprising contacting the mixture with an oxidation catalyst in the presence of oxygen, wherein the catalyst:

comprises a carbon support having a noble metal at a surface of the carbon support; and

is characterized as yielding no more than about 1.2 mmole of carbon monoxide per gram of catalyst when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in the hydrogen atmosphere, is heated in a helium atmosphere from about 20 to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

Claim 249. (previously presented): The process of claim 248 wherein the process is conducted in a continuous reactor system.

Claim 250. (previously presented): The process of claim 248 wherein said carbon monoxide yield is no greater than about 0.7 mmole of carbon monoxide per gram of catalyst.

Claim 251. (previously presented): The process of claim 248 wherein the mixture is acidic.

Claim 252. (currently amended): A process for oxidizing a reagent in a mixture which can solubilize a noble metal, the



process comprising contacting the mixture with an oxidation catalyst in the presence of oxygen, wherein the catalyst:

comprises a carbon support having a noble metal and a promoter at a surface of the carbon support; and

is characterized as yielding no more than about 1.2 mmole of carbon monoxide per gram of catalyst when a dry sample of the catalyst, after being heated at a temperature of about 500[ ] °C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in the hydrogen atmosphere, is heated in a helium atmosphere from about 20 to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes.

Claim 253. (previously presented): The process of claim 252 wherein the process is conducted in a continuous reactor system.

Claim 254. (previously presented): The process of claim 252 wherein said carbon monoxide yield is no greater than about 0.7 mmole of carbon monoxide per gram of catalyst.

Claim 255. (previously presented): The process of claim 252 wherein at least 0.05% by weight of the catalyst consists of at least one promoter.

Claim 256. (previously presented): A process for oxidizing a reagent in a mixture which can solubilize a noble metal, the process comprising contacting the mixture with an oxidation catalyst in the presence of oxygen, wherein the catalyst comprises a carbon support having a noble metal, carbon, and oxygen at a surface of the carbon support, the ratio of carbon atoms to oxygen atoms at the surface being at least about 20:1 as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 257. (previously presented): The process of claim 256 wherein the process is conducted in a continuous reactor system.

Claim 258. (previously presented): The process of claim 256 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 259. (currently amended): A process for oxidizing a reagent in a mixture which can solubilize a noble metal, the process comprising contacting the mixture with an oxidation catalyst in the presence of oxygen, wherein the catalyst:

comprises a carbon support having a noble metal, a promoter, carbon, and oxygen at a surface of the carbon support; and

is characterized as having a ratio of carbon atoms to oxygen atoms at the surface which is at least about 20:1 as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500 [□] °C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 260. (previously presented): The process of claim 259 wherein the process is conducted in a continuous reactor system.

Claim 261. (previously presented): The process of claim 259 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 262. (previously presented): The process of claim 259 wherein at least 0.05% by weight of the catalyst consists of at least one promoter.

Claim 263. (previously presented): A process for oxidizing a reagent in a mixture which can solubilize a noble metal, the process comprising contacting the mixture with an oxidation catalyst in the presence of oxygen, wherein the catalyst comprises a carbon support having (a) a noble metal at a surface

of the carbon support; and (b) a surface layer having a thickness of about 50 Å as measured inwardly from the surface and comprising oxygen and carbon, the ratio of carbon atoms to oxygen atoms in the surface layer being at least about 20:1 as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 264. (previously presented): The process of claim 263 wherein the process is conducted in a continuous reactor system.

Claim 265. (previously presented): The process of claim 263 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 266. (currently amended): A process for oxidizing a reagent in a mixture which can solubilize a noble metal, the process comprising contacting the mixture with an oxidation catalyst in the presence of oxygen, wherein the catalyst:

comprises a carbon support having: (a) a noble metal and a promoter at a surface of the carbon support; and (b) a surface layer having a thickness of about 50 Å as measured inwardly from the surface and comprising carbon and oxygen; and

is characterized as having a ratio of carbon atoms to oxygen atoms in the surface layer of at least about 20:1 as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500[ ] °C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere.

Claim 267. (previously presented): The process of claim 266 wherein the process is conducted in a continuous reactor system.

Claim 268. (previously presented): The process of claim 266 wherein said ratio of carbon atoms to oxygen atoms is at least about 30:1.

Claim 269. (previously presented): The process of claim 266 wherein at least 0.05% by weight of the catalyst consists of at least one promoter.

Claim 270. (currently amended): A process for oxidizing a reagent in a mixture which can solubilize a noble metal, the process comprising:

forming an oxidation catalyst by a process comprising depositing a noble metal and a promoter at a surface of a carbon support, and then heating the surface at a temperature of at least about 400°C; and

contacting the mixture with the oxidation catalyst in the presence of oxygen.

Claim 271. (previously presented): The process of claim 270 wherein the mixture is contacted with the oxidation catalyst in the presence of oxygen in a continuous reactor system.

Claim 272. (previously presented): The process of claim 270 wherein at least 0.05% by weight of the catalyst consists of at least one promoter.

Claim 273. (previously presented): The process of claim 272 wherein the promoter is more easily oxidized than the noble metal.

Claim 274. (previously presented): The process of claim 272 wherein the promoter comprises a metal selected from the group consisting of tin, bismuth, lead, cadmium, magnesium, manganese, nickel, aluminum, cobalt, titanium, antimony, selenium, iron, rhenium, cerium, zinc, and zirconium.

Claim 275. (previously presented): The process of claim 272 wherein the promoter comprises tin.

Claim 276. (previously presented): The process of claim 272 wherein the promoter comprises iron.

Claim 277. (previously presented): The process of claim 272 wherein the promoter comprises titanium.

Claim 278. (previously presented): The process of claim 272 wherein at least two promoters are deposited at the surface of the carbon support.

Claim 279. (previously presented): The process of claim 278 wherein the promoters comprise iron and tin.

Claim 280. (previously presented): The process of claim 272 wherein noble metal atoms at the surface are alloyed with the promoter.

Claim 281. (previously presented): The process of claim 272 wherein a majority of the noble metal atoms at the surface are alloyed with the promoter.

Claim 282. (previously presented): The process of claim 272 wherein substantially all of the noble metals at the surface are alloyed with the promoter.

Claim 283. (previously presented): The process of claim 270 wherein said temperature is at least about 500°C.

Claim 284. (previously presented): The process of claim 270 wherein, before the noble metal deposition, the carbon support has carbon and oxygen at a surface of the carbon support in amounts such that the ratio of carbon atoms to oxygen atoms at

the surface is at least about 20:1 as measured by x-ray photoelectron spectroscopy.

Claim 285. (previously presented): The process of claim 270 wherein said heating is conducted in a non-oxidizing environment.

Claim 286. (previously presented): The process of claim 285 wherein the non-oxidizing environment comprises a reducing environment.

Claim 287. (previously presented): The process of claim 286 wherein the reducing environment comprises  $H_2$ .

Claim 288. (previously presented): A process for oxidizing a reagent in a mixture which can solubilize a noble metal, the process comprising:

forming an oxidation catalyst by a process comprising: (a) depositing a noble metal at a surface of a carbon support, and (b) exposing the surface to a reducing environment; and

contacting the mixture with the oxidation catalyst in the presence of oxygen,

wherein, before the noble metal deposition, the carbon support has carbon and oxygen at the surface of the carbon support in amounts such that the ratio of carbon atoms to oxygen atoms at the surface is at least 20:1 as measured by x-ray photoelectron spectroscopy.

Claim 289. (previously presented): The process of claim 288 wherein the mixture is contacted with the oxidation catalyst in the presence of oxygen in a continuous reactor system.

Claim 290. (previously presented): The process of claim 288 wherein at least 0.05% by weight of the catalyst consists of at least one promoter.

Claim 291. (previously presented): The process of claim 290 wherein the promoter is more easily oxidized than the noble metal.

Claim 292. (previously presented): The process of claim 290 wherein the promoter comprises a metal selected from the group consisting of tin, bismuth, lead, cadmium, magnesium, manganese, nickel, aluminum, cobalt, titanium, antimony, selenium, iron, rhenium, cerium, zinc, and zirconium.

Claim 293. (previously presented): The process of claim 290 wherein the promoter comprises tin.

Claim 294. (previously presented): The process of claim 290 wherein the promoter comprises iron.

Claim 295. (previously presented): The process of claim 290 wherein the promoter comprises titanium.

Claim 296. (previously presented): The process of claim 290 wherein at least two promoters are deposited at the surface of the carbon support.

Claim 297. (previously presented): The process of claim 296 wherein the promoters comprise iron and tin.

Claim 298. (previously presented): The process of claim 290 wherein noble metal atoms at the surface are alloyed with the promoter.

Claim 299. (previously presented): The process of claim 290 wherein a majority of the noble metal atoms at the surface are alloyed with the promoter.

Claim 300. (previously presented): The process of claim 290 wherein substantially all of the noble metals at the surface are alloyed with the promoter.